

## Energy shame

The history of energy research highlights the importance and inadequacies of markets, and a yawning gap in the priorities of governments. It's time for a radical change.

Frances Cairncross, chair of Britain's Economic and Social Research Council, has been thinking about the economics of climate change longer than most natural scientists and economists. In her presidential address to the annual meeting of the British Association for the Advancement of Science this week, she rightly emphasized one of the most important things that governments can do: invigorate and focus research into the basic and translational science needed for new energy-conversion technologies.

Solar power is a case in point. Its great economic attraction is that, unlike nuclear power or carbon capture and storage, it does not need vast capital investment in order to spread. Its products just need to be priced in such a way that consumers and companies want to buy them. Once that point is reached, a solar-cell factory can produce the capacity to generate electricity as easily as a power station does, thus offering the possibility of exponential growth.

As we report on page 19, a boom in the solar-energy business, led by Japan and Germany, has now attracted serious interest from, among others, the technologists and venture capitalists of California's Silicon Valley. The people who brought the world Moore's law are eager to help it sustain itself through clean technology while accumulating yet more wealth on the way. Its most vigorous proponents suggest that attracting the attention of high-tech entrepreneurs could in itself be an end to our energy woes — a "distributed Manhattan project that attracts the smartest, most ideal people for the task", as Bill Gross, serial entrepreneur and trustee of the California Institute of Technology, put it to *The New York Times* earlier this year.

But a healthy respect for the power of entrepreneurs and free markets cannot hide the fact that they do best when choosing between possibilities that are close to market, rather than inventing entirely new options. There is research into new materials and technologies that small start-up companies can't do, and that larger, more staid ones, if history is a guide, won't.

History may not be a guide, of course. But even the possibility that

the research may not get done is a reason for government to step in and ensure that it does, while trying not to crowd out private capital in the process. The current solar boom is dependent on old and trusted technologies — the companies now piling in are mostly finding new ways to manufacture and process familiar products. If the current rate of heady growth is to keep going for the quarter-century needed to start making a real change in the world's energy outlook, we will need new materials to capture the Sun's power ever more cheaply and easily, and new solutions to the problem of storing it.

Many scientists are eager to set out in search of those technologies. It is essential that curiosity-led research should flourish in these areas, and that funding bodies should encourage it so to do.

There are also areas where directed research might come into its own — where the best approach may be to try out lots of possibilities, rather than go with what a few bright people think is best. One of the strengths of the Manhattan project was that it tried out as many roads to nuclear weaponry as seemed plausible. Governments need to be willing to take advice on directed research and then make it happen, rather than just hoping that curiosity will triumph unaided.

Talk of a Manhattan project to tackle the generation and storage of 'clean' energy may seem overblown. It shouldn't. The challenge of increasing energy use in the developing world while at least stabilizing and ideally decreasing carbon dioxide emissions is immense. It is to the abiding shame of the world's governments that, as the threat to the climate has become ever more apparent over the past two decades, funding for energy research and development has actually fallen. To suggest that spending on energy research should be limited only by the capacity of scientists and technologists to make practical use of it is not to be profligate, but rational.

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